Prepared to Prone

Sarah Fye BSN, RN
Lehigh Valley Health Network, Sarah.Fye@lvhn.org

Alexandria Kleine BSN, RN
Lehigh Valley Health Network, Alexandra_E.Kleine@lvhn.org

Alexander Prudente BSN, RN
Lehigh Valley Health Network, Alex_M.Prudente@lvhn.org

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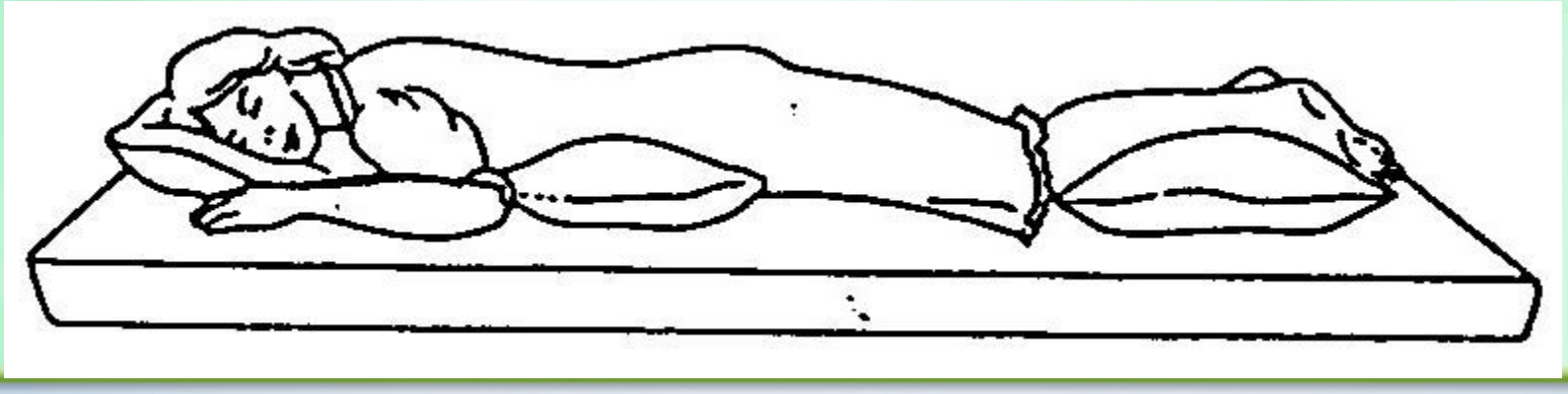
Alexandra Kleine, RN BSN

Alexander Prudente, RN BSN

Sarah Fye, RN BSN



PURPOSE

To develop a standardized prone protocol to provide safe and effective therapy to patients

PICO QUESTION

In adult ICU patients with ARDS, will the use of prone positioning improve respiratory outcomes when compared to standard supportive therapy?

PRONE POSITIONING

What is the benefit?

- It is used as a short-term supportive therapy in an attempt to improve gas exchange in patients with severely compromised lungs
- Greater than 70% of patients with ARDS will show a 20% increase in PaO2 within two hours of placement in the prone position

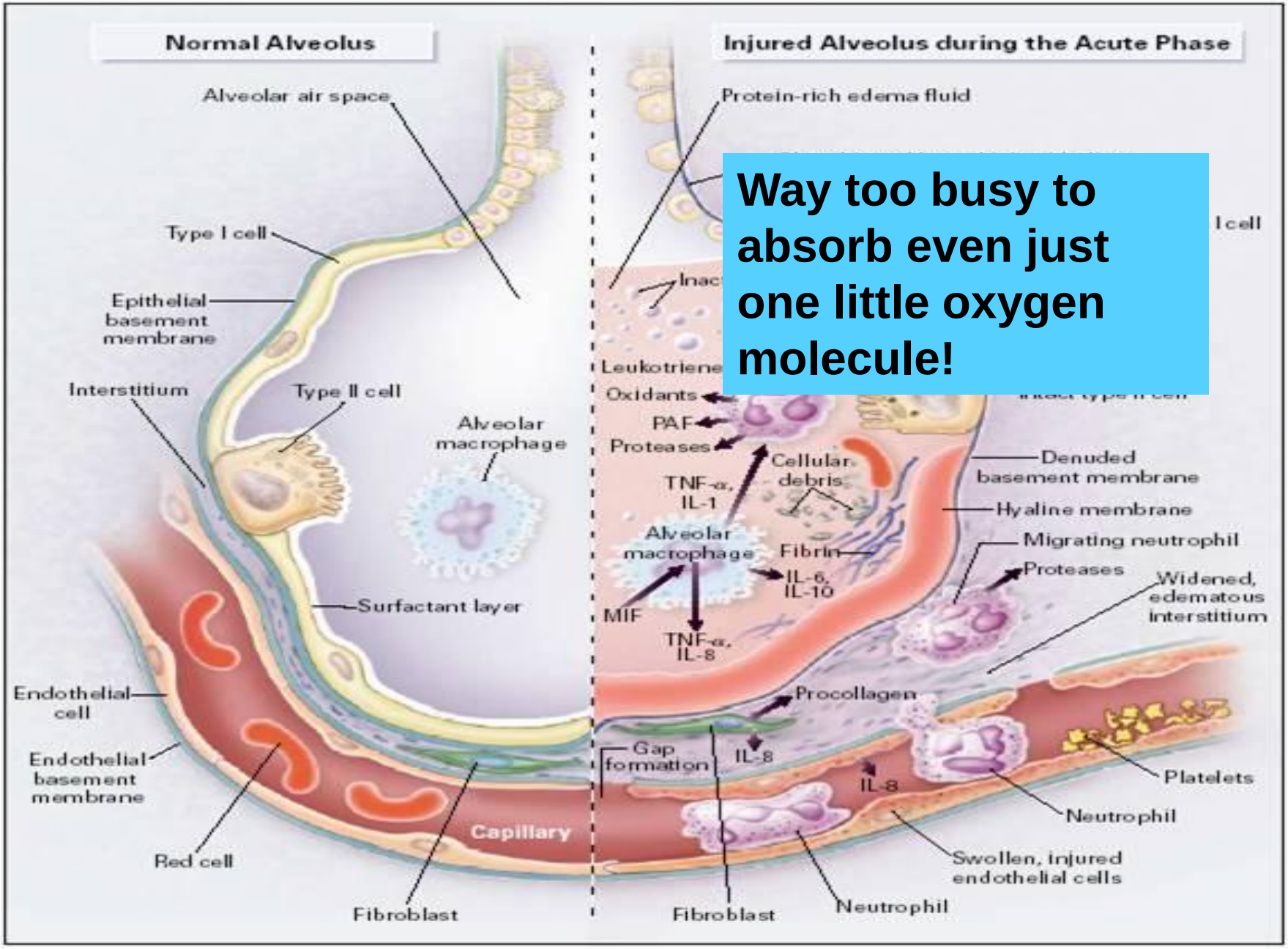
ARDS PATHOPHYSIOLOGY

Acute Respiratory Distress Syndrome

- It occurs either as a result of direct or indirect lung injury
  - Known causes include sepsis, trauma, surgery or other serious illnesses
- Results in severe hypoxemia refractory to conventional treatment
- Mortality rate of 35 to 45 percent

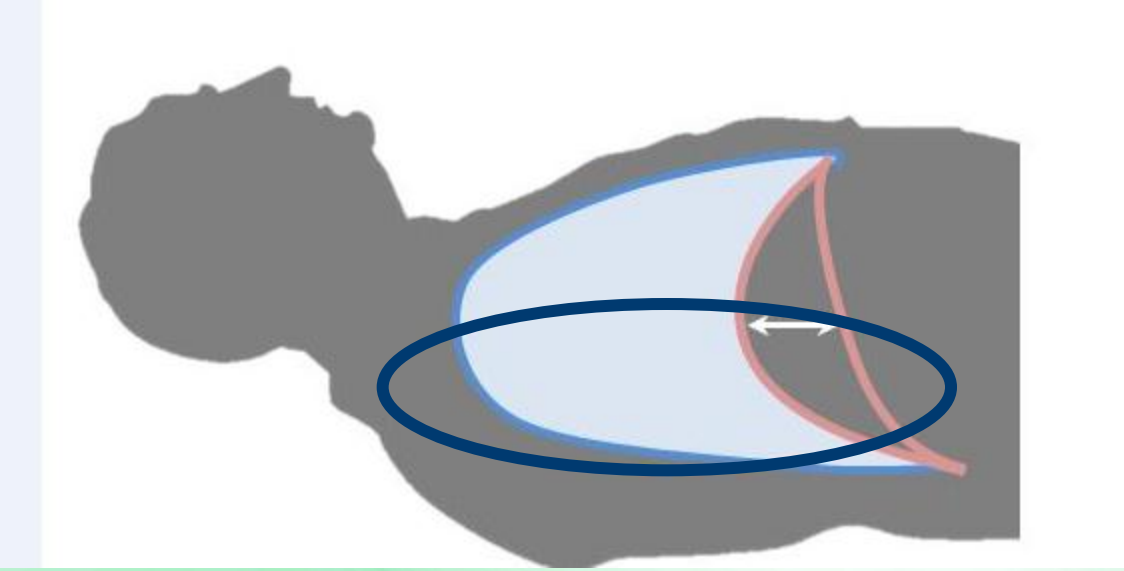
ARDS DEFINITION

- Occurs within one week of known insult or new or worsening respiratory syndrome.
- Bilateral infiltrates on chest xray
- Respiratory failure not explained by cardiac failure or fluid overload
- Hypoxemia
  - Mild
  - Moderate
  - Severe


Normal Alveolus
Injured Alveolus during the Acute Phase
Alveolar air space
Protein-rich edema fluid
Type I cell
Epithelial basement membrane
Interstitium
Type II cell
Alveolar macrophage
Surfactant layer
Endothelial cell
Endothelial basement membrane
Red cell
Capillary
Fibroblast
Leukotriene
Oxidants
PAF
Proteases
TNF-α, IL-1
Cellular debris
Alveolar macrophage
Fibrin
IL-6, IL-10
MIF
TNF-α, IL-8
Denuded basement membrane
Hyaline membrane
Migrating neutrophil
Proteases
Widened, edematous interstitium
Procollagen
Gap formation
IL-8
IL-8
Platelets
Neutrophil
Swollen, injured endothelial cells
Fibroblast
Neutrophil
Way too busy to absorb even just one little oxygen molecule!

SUPINE PERFUSION

- When a patient is supine lung perfusion occurs in tissue that is injured resulting in less than adequate oxygenation



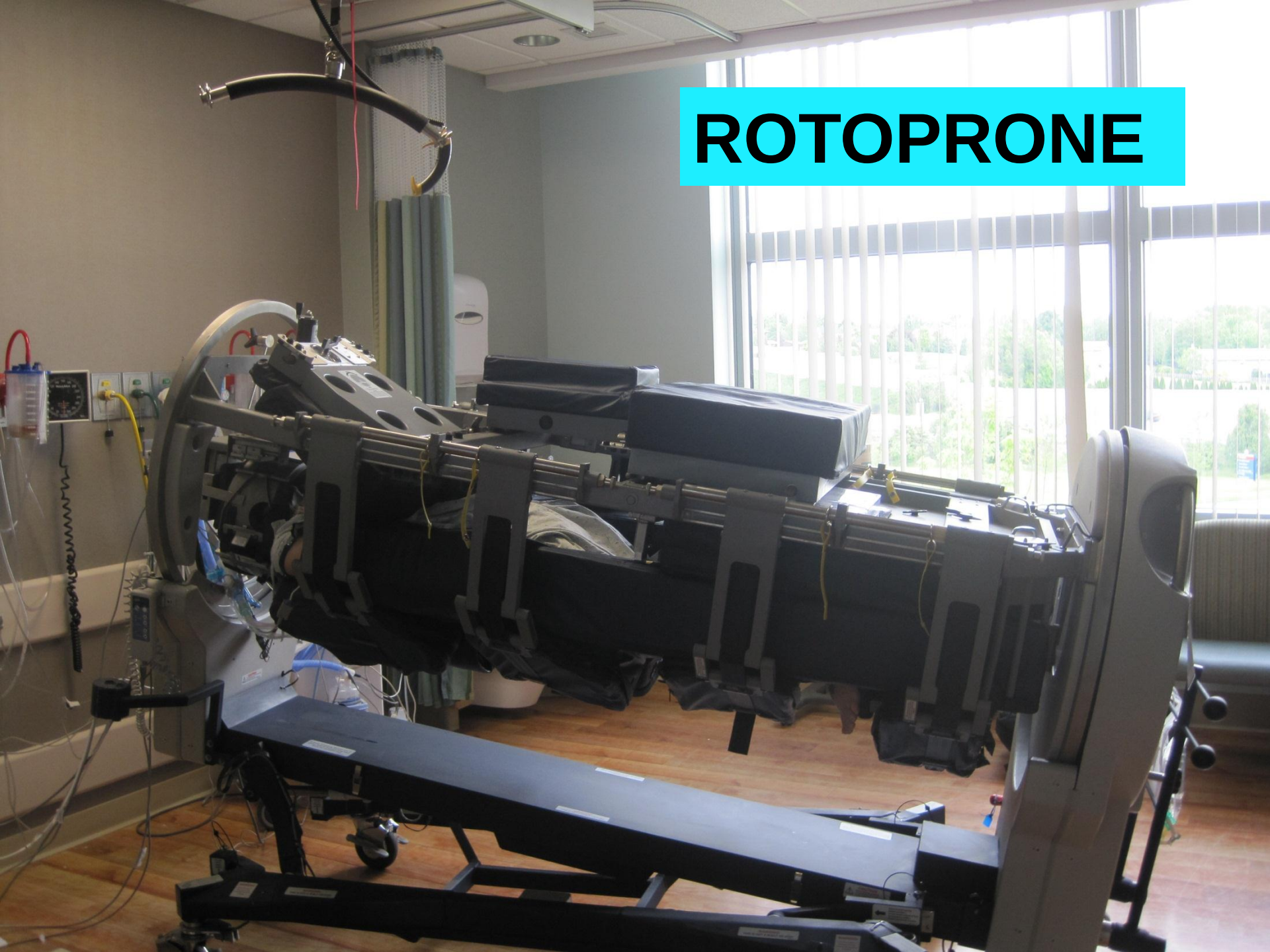
ARDS TREATMENT OPTIONS

- **Supportive therapy including:**
  - ARDS Net Ventilation
    - Small tidal volume ventilation
  - Volume Diffusive Respiration
  - Prone Positioning
  - ECMO

ARDS VENTILATOR THERAPY

OPTIONS FOR PRONING

- Rotoprone-rental bed, self contained unit with programmable turn system; limited availability
- Triadyne-air bed with proning cushions
- Manual Turn-patient is turned on existing surface
- Tortoise Prone Positioner-new product


ROTOPRONE

TRIADYNE PROVENTA WITH PRONING CUSHIONS

Tortoise Positioner

SURVIVING SEPSIS CAMPAIGN
Recommendations on Proning

- We suggest prone positioning in sepsis-induced ARDS patients with a PaO2/FIO2 ratio <= 100 mm Hg in facilities that have experience with such practices (grade 2B).

EVIDENCE

- Fernandez, R. et al. (2008)
- RCT investigated positioning patient supine versus prone up to 20 hours/day with initial positioning event within 48 hours post diagnosis of ARDS.
  - Supine: n= 19; Prone: n= 21.
  - 15% lower mortality in prone group (38%) compared to supine group (53%).

EVIDENCE

- Wright, A. and Flynn, M. (2011). Using the Prone Position…(lit review)
  - Prone positioning of ventilated patients first used in the 1970's
  - While positioning helped improve oxygenation, overall mortality did not improve.
  - Inconsistent use continued; further studies revealed
    - Prone positioning is best applied in multiple episodes for long periods, using a reverse trendelenberg position with a free abdomen.. However…
      - Evidence is not robust
      - Studies have variations in designs
      - More research is needed

THE STUDY THAT STARTED IT ALL AGAIN !

EVIDENCE

- Guerin, C. et al. (2013) RCT investigated positioning patients supine versus prone for at least 16 hours/day with initial positioning event within 12-24 hours post diagnosis of ARDS.
- Supine: n= 229; Prone: n= 237.
- 28 day mortality for prone group was 16%, for supine group was 32.8% (P< 0.001).
- 90 day mortality for prone group was 23.6% and for supine group was 41% (P <0.001).

BARRIERS & STRATEGIES

- Barrier:
  - Complexity of manually proning a patient, potential risks to patient when prone (i.e. disruption of invasive lines, skin breakdown, etc.).
  - No physician consensus on which therapy to use

- Strategy to Overcome:
- Educate staff on: pathophysiology of ARDS, benefits of proning in treatment of ARDS, manuevers to manually prone, importance of thorough/frequent skin assessment and care. Practice implementing manual proning manuevers with mannequin.

EXPECTED OUTCOMES

- Clinical practice guideline for prone therapy
- Standardized proning procedure
- Bed surface identification

PROJECT PLANS

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References

- Fernandez, R. et al. (2008). Prone positioning in acute respiratory distress syndrome: a multicenter randomized clinical trial. Intensive Care Med. 2008 Aug;34(8):1487-91.
- Guerin, C. et al. (2013). Prone positioning in severe acute respiratory distress syndrome. New England Journal of Medicine 368:2159-2168
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Make It Happen

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